Symmetry for Nearest Stars and N-body Problem with Delay for Interaction.

R.T.Faizullin

Omsk State University, Pr. Mira 55a, 644077, Omsk-77, Russia

In natural way one can distinguish regular structures of the visible stars as constellations. But there are also *natural* coordinate systems which can give us information on more subtle structure and associations between the functions of coordinates, moments and masses. It is also possible to introduce an order, or, in other words, enumeration of the stars, which is associated with these functions. These are (α, δ), (l, b), (λ, β) moment related coordinate systems, and enumeration according to the visual brightness, or, more properly, according to the physical characteristic V [1]. For the first 20 stars their numbers and (α, δ) coordinates are given below:

1 αCma 6h 43 -16 -35; 2 αCar 6h 23 -52 -40; 3 $\alpha Bool$ 14h 13 19 27; 4 αLyr 18h 35 38 44; 5 αCen 14h 36 -60 -38; 6 αAur 5h 13 45 57; 7 βOri 5h 12 -8 -15; 8 αCmi 7h 37 5 21; 9 αOri 5h 52 7 24; 10 αEri 1h 36 -57 -29; 11βCen 14h 0 -60 -8; 12 αAql 19h 48 8 44; 13 αCru 12h 24 -62 -49; 14 αTau 4h 33 16 25; 15αSco 16h 26 -26 -19; 16 αVir 13h 23 -10 -54; 17 βGem 7h 42 28 9; 18 αPsa 22h 55 -29 -53; 19 βCru 12h 45 -59 9; 20 αCyg 20h 40 45 6;

As an example, let us consider the stars with numbers 5, 6, 8, 12, 14, 15 on (λ, β) coordinate plane – Fig.1. It is an example of graph of a new kind: *each point i belongs to a straight line drawn through other two points j,k from the list, the sum of j and k being equal to 20.*

Note that these are really *the nearest* extremally massive objects (may be, with exception of 15), and, besides that, the stars 5, 8, 12, 6, 15, 14 also provide a regular structure on (l,b) plane – Fig.2.

Using the coordinates of the nearest stars, we can construct another regular structure, or, in other words, give an example of graph of a new kind, using the representation of the stars with numbers 5, 8, 9, 12, 13, 17 in the galactic coordinate system – Fig.3. For these numbers and their complements with respect to 20 we can conclude that: *for each numbered node i there is an interval*

1

whose length is proportional to the number i; there are also intervals whose lengths are proportional to the complements with respect to 20; each such interval is connected with the corresponding node (the plot is extended twice along the axis b).

When moving period by period along the line (10,3) in the plane (λ, β), the coordinates of the stars with numbers 25, 15, 6, 5, 11, 20, 2 concentrate closely to this line. And what is more, there is "almost divisibility by five" – the stars with numbers 5, 10, 15, 20, 25, 30, 35, 40, 45, 50 (and 6, 11, 19, 21, 29, 31, 36, 39) concentrate only to certain lines (more then two points on one line in all the coordinate systems).

It is well known that there is a structure of new O, B and AO stars; Herschel (1847) was the first to note that, and statistically convincing arguments were given by Guld (1879), that is so called Guld zone. Some visual phenomena associated with the enumeration according to the brightness may be indicative of existence of a more subtle structure.

With rare exception, most part of O, B and AO stars (brighter than 6.0^m) is concentrated near the straight lines drawn through pairs of the stars with numbers 2, 3, 5, 6, 7, 10, 11, 15; that is true for (l, b), (α, δ), (λ, β) coordinate planes. This fact is illustrated on Figs.4,5.

This property is true also for the group 2, 6, 7, 10, 15 for earlier times $(-10^6, -2 * 10^6$ years) on (l, b) plane.

Perhaps this phenomenon is not completely visual, there is a substructure of stars of βPer (EA) and βLyr (EB) types, which concentrate only to *some* of the lines in all the coordinate systems. It is an independent test, in the average the brightness of these stars is $8 - 9^m$. K, M giants also gravitate towards these lines, but their positions are more smeared than those of O, B stars.

When considering the group of the stars with numbers 3, 4, 6, 7, 8, 9, 10, 11, 13, 17, we also can see that the most part of the bright galactic objects (brighter than $6^m, 11^m$) concentrate to analogous system of straight lines.

This can be a result of the view from the inside of interacting vortices, where the points 7, 5, 10, 15 lie near the singular points of the vortices.

What's kind of invariance can be choosen for description of these phenomenon? If we consider N-body problem with delay for gravitational interaction then we have some limitation for the distances and velocities. It's follows from deduction of the energy integral for Newton law with delay. Velosity should be less then signal velosity c for interactioned bodies and distances greater then gravitational radius in every time. Moreover, there can be upper limitation for distances and velosities for bodies are greater then velosities for standard model.

Computer simulation for hierachical coupling [2] with delay for gravitational interactions may be give to us same configurations as "eigenfunctions" for the arbitrary initial density distribution.

References
1. P.G.Kulikovski, *Stars astronomy*, Nauka ,Moskow(1985)

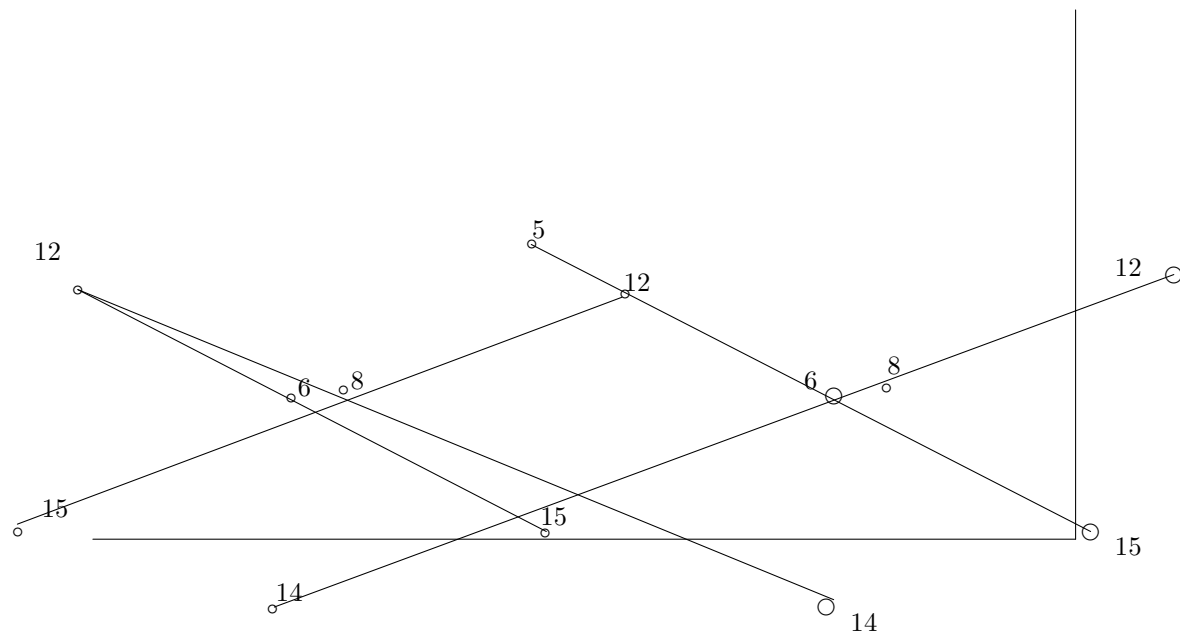2. R.T.Faizullin, *Massexchange in globula cloud*, Omsk St.Univ.,
Omsk(1994)

Fig.1 λ, β plane, puzzle with
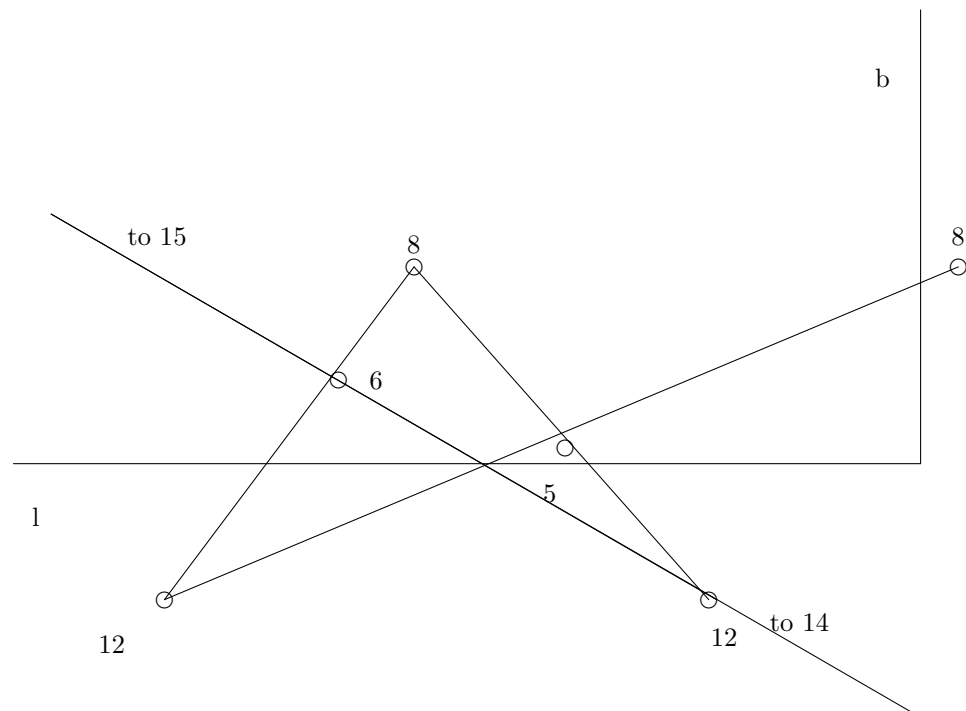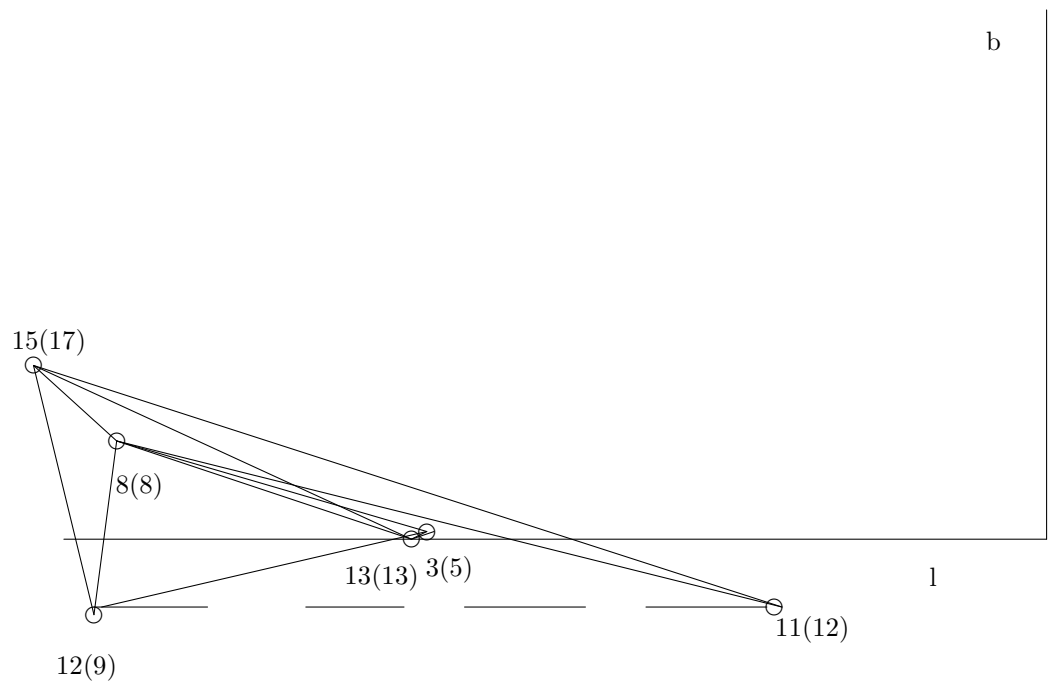numbers 5,6,8,12,14,15 and number 20

Fig.2 Puzzle 12,5,8 on (l,b) plane.

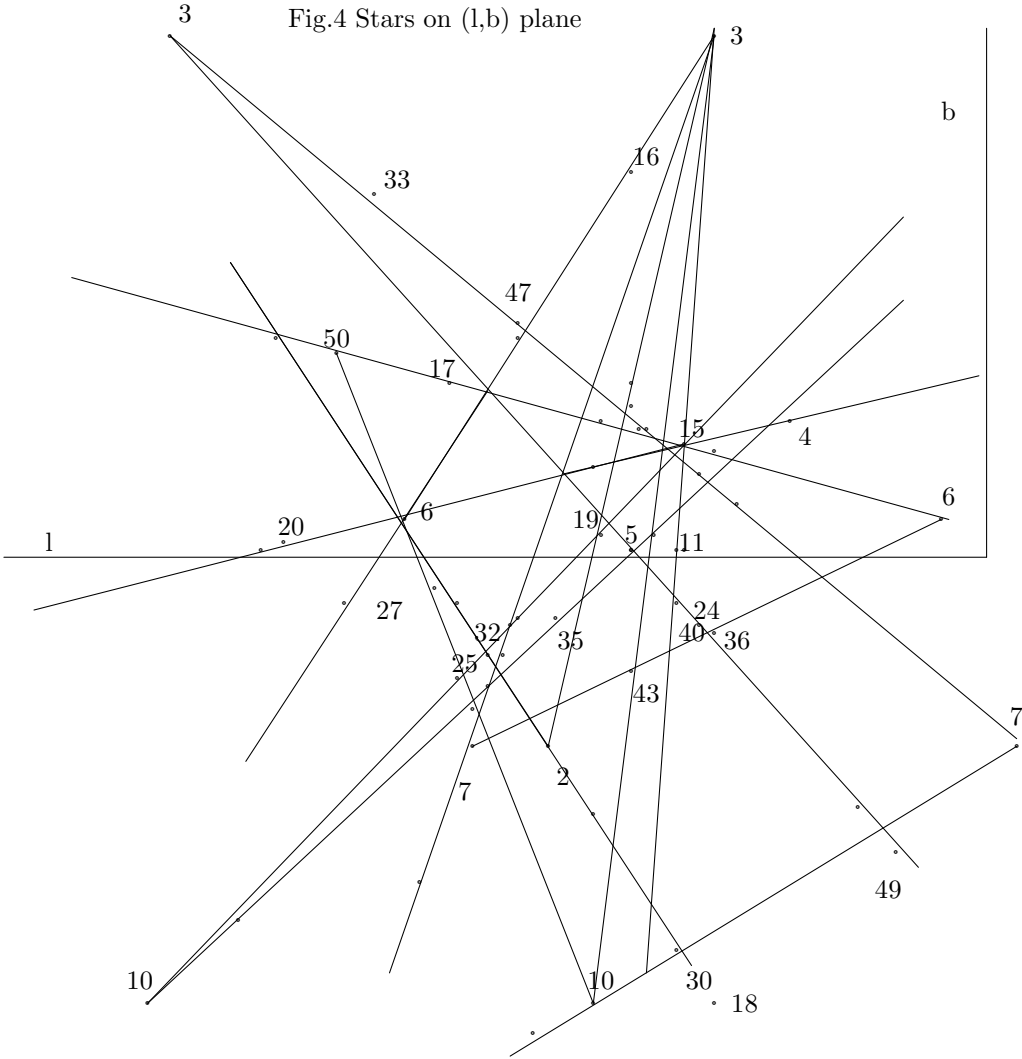Fig.3 Graph with associations between enbumeration and distances.

Fig.4 Stars on (l,b) plane

Fig.5 α, β plane
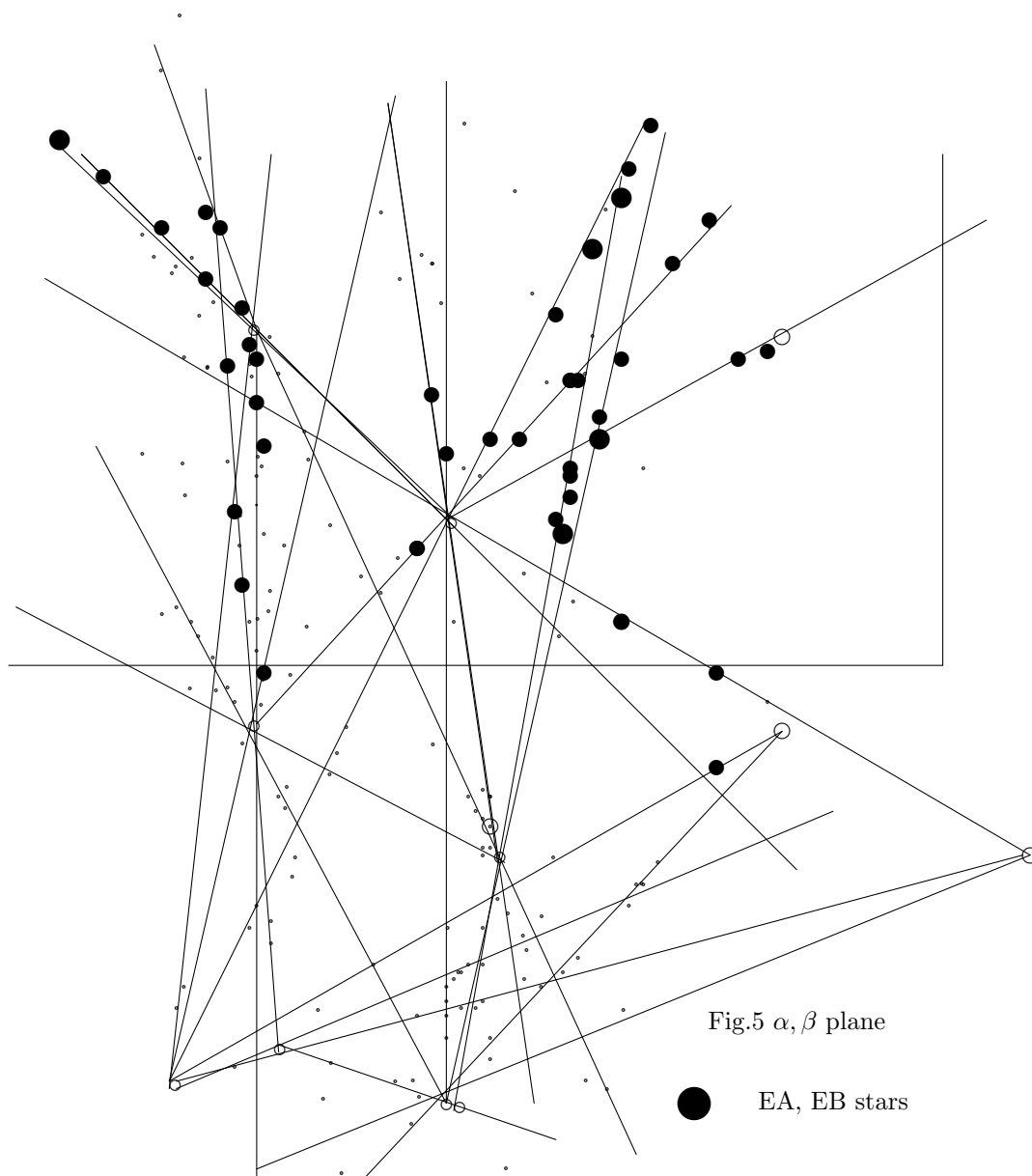
● EA, EB stars